Claims

What is claimed is:

1.   A method for decoding a linear block encoded string of information bits comprising the steps of:

a.   converting the string of information bits into a plurality of codewords, wherein each codewords has a length N;

b.   performing hard and soft decisions on each codeword in order to generate a hard decision vector h of length N and a soft decision vector c of length N;

c.   computing the syndrome of the hard decision vector h by using Galois Field Arithmetic;

d.   finding the location of the two minimum values in the soft decision vector by the Galois Field Arithmetic and designating these locations as LOW1 and LOW2,

e.   xoring the LOW1 and LOW2 with a $Nc1$ bit locations, wherein a $Nc2$ bit location is generated.

f.   swapping the soft decision value at location $Nc1$ with the soft decision value at location $Nc2$ for each nearby valid codewords computed;

g.   determining which soft decision value sum is the lowest and designate this as Min1;

h.   designating two bit locations which created Min1 as MinA and MinB;

i.   designating the next lowest soft value sum as Min2;

j.   replacing the value at bit location MinA with the value of Min2 minus the current value at bit location MinA,

k.   replacing the value at bit location MinB in the soft decision vector with the value of Min2 minus the current value at bit location MinB;

l.   subtracting the value of Min1 from the values in all other bit locations in the soft decision vector in order to generate an output codeword; and

m.   2's complementing all soft values in the output codeword at bit locations which correspond with bit locations in the hard decision vector having a 0 in their location and creating the new signed soft value vector.

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